

The Architecture of Creativity: Cognitive-Productive and Expressive-Experiential Dimensions in the Scale of Creative Attributes and Behavior

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ABSTRACT - The present study replicated and extended the factor structure of the Scale of Creative Attributes and Behavior (SCAB; Kelly, 2004) in an undergraduate sample. A principal components analysis of the 20 SCAB items reproduced the original five factors: Creative Engagement, Creative Cognitive Style, Spontaneity, Tolerance, and Fantasy. These factors accounted for 65% of the variance and demonstrating adequate internal consistency. A second principal components analysis using subscale scores revealed two higher-order dimensions: a Cognitive-Productive factor (engagement and cognitive style) and an Expressive-Experiential factor (spontaneity, tolerance, and fantasy), together accounting for 59% of the variance. These findings refine the SCAB's hierarchical structure and suggest that creativity comprises both disciplined, intellectually focused, and affectively open, imaginative forms of expression. Results confirm the scale's factorial validity, reliability, and theoretical relevance for assessing multidimensional creativity within personality research.

Keywords:
Creativity; Factor analysis; Psychometrics; Scale of Creative Attributes and Behavior (SCAB); Creative cognition; Imaginative expression; Creativity assessment

Introduction

Creativity has long been a central topic in personality and individual differences research. Across decades researchers have sought to understand why some individuals consistently produce original ideas and novel solutions, whereas others prefer established modes of thought and expression. Simonton (1999) reviewed this broad literature and identified several recurring

characteristics of highly creative individuals: elevated intelligence, a flexible and divergent cognitive style, openness to new experiences, intrinsic motivation and persistence, relative independence from social conformity, and occasionally, mild forms of nonpathological disinhibition or psychotic-like ideation. Collectively, these characteristics suggest that creativity represents a multifaceted integration of cognitive, affective, and personality attributes that promote exploration, originality, and self-expression.

Subsequent research has supported this multidimensional perspective. Creative individuals tend to display humor and cognitive playfulness (Wycoff & Pryor, 2003), high need for cognition and curiosity (Kaufman, 2018), and a distinctive combination of openness and autonomy (Sheldon, 1995). Personality research situates creativity most strongly within the domain of openness to experience of the Five-Factor Model (John et al., 2008), reflecting imagination, aesthetic sensitivity, and cognitive exploration. However, empirical work also indicates that creativity involves social–emotional qualities such as tolerance, spontaneity, and fantasy, which may not be fully captured by conventional trait models (Feist, 2010). Thus, a valid multidimensional assessment of creativity requires attention to both cognitive–intellectual and expressive–affective components.

Early measures such as the Torrance Tests of Creative Thinking (Torrance, 1974) and Gough's (1979) Creative Personality Scale advanced the field by operationalizing divergent thinking and personality correlates of creativity. Yet, these instruments often emphasized singular aspects of creativity focusing on either cognitive ability or personality rather than the interplay among behavioral engagement, cognitive flexibility, and imaginative expression. To address this limitation, Kelly (2004) developed the Scale of Creative Attributes and Behavior (SCAB) as a concise self-report measure designed to assess creativity as a multidimensional phenomenon. Drawing from classic and contemporary theories, the SCAB includes five empirically derived dimensions: Creative Engagement, Creative Cognitive Style, Spontaneity, Tolerance, and Fantasy. Together, these represent enjoyment of creative activity, intellectual curiosity, risk-taking and flexibility, openness to differing ideas, and imaginative mental life.

Initial validation studies supported the factorial integrity and reliability of the SCAB (Kelly, 2004), as well as its convergent relationships with openness to experience and artistic vocational interests (Kelly, 2006; Kelly & Kneipp, 2009). Subsequent work linked SCAB dimensions with interest in environmental aesthetics (Kelly & Kelly, 2014), preferences for a creative academic environment which includes opportunities for pleasure reading (Kelly & Daughtry, 2008), and creative achievement among working writers (Kelly, 2016), further reinforcing its construct validity. Despite these promising findings, few independent replications of the SCAB's factor structure have been reported, and the higher-order organization among its five dimensions remains somewhat unclear. Kelly (2004) originally proposed a single hierarchical creativity factor, yet later research hints that multiple domains, such as cognitive-productive and expressive-affective, may underlie self-reported creative attributes and behaviors (Feist, 1998; Ivcevic & Mayer, 2009; Silvia et al., 2011; DeYoung, 2014; Feist, 2010).

Given growing recognition that creativity encompasses diverse yet interrelated processes (Beaty et al., 2016; Feist, 2010), further psychometric examination of the SCAB is warranted. Clarifying whether the SCAB's five dimensions represent a unified or multidimensional construct

has both theoretical and applied value. Demonstrating factorial stability in an independent sample provides essential evidence for construct validity (Flake et al., 2017) and informs how creativity manifests through structured cognitive engagement versus expressive and imaginative experience.

The Present Study

The present study sought to replicate and extend the original findings reported by Kelly (2004) using a new sample of university students. Specifically, the study aimed to: 1) Reexamine the factor structure of the SCAB at the item level using principal components analysis to verify the presence of the five original dimensions; 2) Evaluate the higher-order structure of the SCAB by conducting a second principal components analysis of subscale scores to determine whether a single or multifactorial model best represents the data; and 3) Assess the internal reliability and intercorrelations among SCAB subscales to examine their coherence and distinctiveness.

Hypotheses

The following hypotheses guided data analysis and interpretation:

Hypothesis 1: Replication Hypothesis: A five-factor solution at the item level will replicate Kelly's (2004) original structure, yielding factors corresponding to Creative Engagement, Creative Cognitive Style, Spontaneity, Tolerance, and Fantasy.

Hypothesis 2: Higher-Order Hypothesis: While a single creativity factor is possible, it was predicted that the five subscales will load on a two-factor solution (reflecting cognitive-productive and expressive-experiential domains).

Hypothesis 3: Reliability Hypothesis: Each SCAB subscale will demonstrate adequate internal consistency ($\alpha \geq .70$) and moderate to strong correlations with total SCAB scores, supporting its construct coherence.

Method

Participants and Procedure

After providing informed consent, 225 undergraduate students (180 women, 45 men) enrolled in psychology courses at a small university in the southern United States completed the survey in classroom settings. The mean age was 27.5 years ($SD = 8.8$; range = 18–56). The majority of participants identified as White/Caucasian ($n = 187$; 83.2%), followed by Black/African American ($n = 30$; 13.3%), Native American ($n = 4$; 1.8%), Other ($n = 3$; 1.3%), and Latinx ($n = 1$; 0.4%).

Testing sessions were conducted prior to regular class meetings. Participation was voluntary and took approximately 15 minutes. A small amount of extra course credit was provided in exchange for participation. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013 revision) and American Psychological Association.

Measure

Scale of Creative Attributes and Behavior (SCAB; Kelly, 2004) Creativity was assessed using the 20-item Scale of Creative Attributes and Behavior (SCAB), a brief self-report instrument

designed to measure creativity as a multidimensional construct. The SCAB yields five subscales representing theoretically derived components of creativity: 1) Creative Engagement – enjoyment of creative activities and regular involvement in creative projects (e.g., “I work on some type of creative project on a daily basis”). 2) Creative Cognitive Style – the cognitive aspect of creativity, including divergent thinking and problem solving (e.g., “I am often able to make connections between seemingly unrelated things or situations”). 3) Spontaneity – a personality style characterized by impulsivity, excitement seeking, and risk taking (e.g., “I am very spontaneous”). 4) Tolerance – flexibility and openness to others’ ideas and experiences (e.g., “I am accepting of other peoples’ ideas”). 5) Fantasy – imaginative and daydreaming tendencies (e.g., “I like to imagine going to new places”).

Participants rated each statement on a 7-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Negatively worded items were reverse scored so that higher values reflected greater creativity. The standard instructions for the SCAB were used which emphasized that creativity includes any form of idea generation or artistic expression:

“There are many different ways to be creative. In responding to the following questions, think of all the new things and ideas that you generate, as well as all the ways you express yourself artistically as creativity. These ideas and expressions may include art, writing, new ideas, new uses for something, etc. Don’t spend too much time on any one statement. Using the scale below, indicate how characteristic of you is each statement.”

Kelly (2004) reported coefficient alpha reliabilities ranging from .75 to .82 across the subscales and one-month test–retest reliability for the total scale of .80. Subsequent studies demonstrated convergent validity with openness to experience, artistic vocational interests, and preference for creative environments (Kelly, 2006; Kelly & Daughtry, 2008; Kelly & Kneipp, 2009).

Data Screening and Analysis

Data were screened for missing values, outliers, and normality; all variables met acceptable assumptions. Descriptive statistics and reliability coefficients were computed for each subscale and for the SCAB total score.

The factorial structure was examined in two stages. First, an item-level analysis was conducted. A principal components analysis (PCA) with varimax rotation was performed on the 20 SCAB items to replicate Kelly’s (2004) original five-factor solution. Factors were retained based on eigenvalues greater than one, scree plot inspection, and theoretical interpretability. Second, subscale-level analysis was calculated. To explore the higher-order structure, a second PCA was conducted using the five subscale scores.

Internal consistency was evaluated using Cronbach’s α . Pearson correlations among subscales were calculated to assess coherence within and across domains. Sociodemographic variables (age, gender) were also examined with SCAB total and subscale scores to examine potential covariate effects.

Results

Preliminary Analyses

Descriptive statistics and internal consistency coefficients for the SCAB total and subscale scores are presented in Table 2. Age was modestly correlated with total SCAB scores, $r(223) = .14$, $p = .041$, but was unrelated to any individual subscale. Neither the SCAB total nor any of its subscales showed significant gender differences, $t's < 1.64$, $p's > .094$. Cronbach's alpha coefficients indicated satisfactory internal consistency for most subscales, ranging from .65 to .88, comparable to those reported by Kelly (2004).

Item-Level Factor Structure

A principal components analysis (PCA) with varimax rotation was conducted on the 20 SCAB items. Five components with eigenvalues greater than 1.0 were extracted, accounting for 65.3% of the total variance. The scree plot showed a distinct "elbow" after the fifth factor, supporting a five-factor solution consistent with Kelly (2004). Table 1 displays the rotated factor loadings. The pattern of item loadings closely replicated the original findings.

Factor 1 (eigenvalue = 3.05; 15.3% variance) reflected Creative Cognitive Style items describing integrative and problem-solving ability. Factor 2 (eigenvalue = 2.83; 14.1% variance) corresponded to Creative Engagement, involving enjoyment and frequency of creative activities. Factor 3 (eigenvalue = 2.72; 13.6% variance) represented Spontaneity, characterized by impulsivity and risk taking. Factor 4 (eigenvalue = 2.46; 12.3% variance) captured Tolerance, reflecting flexibility and openness to others' ideas. Factor 5 (eigenvalue = 2.00; 10.0% variance) corresponded to Fantasy, involving imagination and daydreaming.

All items loaded $\geq .65$ on their expected factors with minimal cross-loadings, supporting replication of the original five-factor configuration and the factorial validity of the SCAB at the item level.

Descriptive Statistics and Subscale Intercorrelations

Means, standard deviations, and alpha coefficients for SCAB total and subscales are shown in Table 2. Correlations among subscales appear in Table 3. Each subscale correlated moderately to strongly with the total SCAB score ($r's = .52-.72$), demonstrating some degree of internal coherence.

Creative Engagement and Creative Cognitive Style were highly correlated ($r = .48$, $p < .001$), indicating overlap between behavioral and cognitive aspects of creativity. Spontaneity, Tolerance, and Fantasy exhibited modest but reliable intercorrelations ($r's = .16-.26$), suggesting a separate affective or expressive cluster. Cross-domain correlations were weaker, supporting the presence of related but distinct dimensions within the SCAB.

Higher-Order Structure

To examine the hierarchical organization of the SCAB dimensions, a second PCA with varimax rotation was performed using the five subscale scores. Two components were extracted, together accounting for 59.2% of the total variance.

Table 1: SCAB items and factor loadings

Item	Factor				
	1	2	3	4	5
1. I spend much of my time creating things	.25	.85	-.04	-.01	.14
2. I dabble in many different hobbies	.06	.80	.14	.08	.01
3. I enjoy creating new things	.24	.78	.07	.07	.07
4. I work on some type of creative project on a daily basis	.29	.77	.07	.01	-.04
5. I am often able to see the “big picture” where others can’t	.82	.17	.13	.08	.01
6. I am often able to make connections between seemingly unrelated things or situations	.81	.23	.15	.07	.11
7. I have an ability to find the hidden potential of ideas that others often can’t see	.87	.22	.03	.14	.08
8. When someone asks me to solve a difficult problem, I can usually find creative solutions	.73	.20	.01	.18	-.06
9. I am somewhat mischievous	.16	-.00	.68	-.13	.19
10. I am very spontaneous	.03	.08	.84	.20	-.04
11. I am impulsive	.03	.15	.81	.05	.10
12. I am a “risk taker”	.08	.02	.79	.20	-.07
13. I am flexible in my thinking	.27	.02	.25	.67	.07
14. I like new ideas	.21	.20	.18	.65	.03
15. I am very tolerant of other people	-.05	.01	.07	.79	.04
16. I am accepting of other peoples’ ideas	.10	-.01	-.15	.80	.11
17. I often fantasize	.20	.07	.20	.18	.72
18. I don’t like to waste my time daydreaming*	.04	.02	-.10	-.05	.85
19. I would have difficulty just letting my mind wander without control or guidance*	-.09	.10	.01	.05	.67
20. I like to imagine going to new places	.05	-.08	.17	.38	.42

Note: *Indicates reverse coded item. Factor loadings above .40 are denoted in **bold** type.

Factor 1 (eigenvalue = 1.51; 30.2% variance) included Creative Engagement and Creative Cognitive Style (loadings = .82 and .82, respectively). Factor 2 (eigenvalue = 1.45; 29.0% variance) included Spontaneity, Tolerance, and Fantasy (loadings = .57, .70, and .76, respectively). This pattern was interpreted as suggestive of two higher-order domains: a Cognitive-Productive factor

reflecting active and intellectual forms of creativity, and an Expressive-Experiential factor encompassing spontaneity, openness, and imagination. Together, these components provide a more differentiated structure than the single overarching creativity factor reported by Kelly (2004), while preserving the conceptual coherence of the original scale. The correlation between summed Cognitive-Productive and Expressive-Experiential factors was $r = .31$, $p < .001$, suggesting some overlap but relative independence between these domains.

Table 2: Scale descriptive statistics

Measure	<i>M</i>	<i>SD</i>	α
SCAB total	95.72	15.09	.831
Creative Engagement	16.72	5.67	.853
Creative Cognitive Style	19.38	5.09	.876
Spontaneity	17.55	5.37	.807
Tolerance	21.84	3.48	.749
Fantasy	20.22	4.58	.655

Note: $N = 225$. SCAB = Scale of Creative Attributes and Behavior.

Table 3: Correlations for SCAB subscales and total scores

Variable	1	2	3	4	5
1. SCAB total scores					
2. Creative Engagement	.68**				
3. Creative Cognitive Style	.72**	.48**			
4. Spontaneity	.60**	.18**	.22**		
5. Tolerance	.57**	.17*	.32**	.25**	
6. Fantasy	.52**	.13	.16*	.16*	.26**

Note: $N = 225$. * $p < .05$ ** $p < .01$.

Discussion

The present study replicated and extended previous findings of the factor structure of the SCAB (Kelly, 2004) in an undergraduate sample. At the item level, results closely reproduced the original five-factor configuration of Creative Engagement, Creative Cognitive Style, Spontaneity, Tolerance, and Fantasy. These findings provide further evidence of the SCAB's factorial validity and internal consistency reliability in assessing multidimensional creativity. In addition, a higher-order analysis of subscale scores revealed two distinct yet related domains that refine understanding of the instrument's structural organization. Together, these results confirm both the robustness and the multidimensional nature of creativity as assessed by the SCAB.

Replication of the Original Structure

The primary objective of the current study was to verify the factorial integrity of the SCAB. Consistent with Kelly (2004), the five components emerged cleanly, accounting for over 65% of

the total variance and exhibiting strong, conceptually coherent loadings. Internal consistency reliabilities were comparable to those reported in prior research (Kelly, 2004, 2006), suggesting that the SCAB's subscales provide stable estimates of individual differences in creative attributes and behaviors. The eigenvalue criteria and the clear break on the scree plot supports the methodological adequacy of the factor retention process. Although PCA was employed as in the original study, the present results parallel what would be expected from an exploratory factor analysis, reinforcing the interpretability of the extracted components. The replication of this structure across independent samples strengthens confidence in the SCAB as a psychometrically sound measure of multidimensional creativity.

Emergence of Two Higher-Order Domains

Beyond replicating the original factors, the second principal components analysis provided evidence for a differentiated higher-order structure. Creative Engagement and Creative Cognitive Style loaded on one component, whereas Spontaneity, Tolerance, and Fantasy loaded together on another. This pattern suggests that the SCAB may capture two broad domains of creativity: a Cognitive-Productive domain characterized by intellectual curiosity, analytic integration, and persistent engagement, and an Expressive-Experiential domain emphasizing emotional openness, imaginative play, and social flexibility.

This two-factor organization aligns with contemporary frameworks describing creativity as the product of dual systems or interacting modes of thought (Beaty et al., 2016; Feist, 2010). Following Beaty et al. (2016) and Feist (2010), the Cognitive-Productive domain parallels constructs such as intellect and creative achievement: goal-directed creativity that integrates analytical reasoning with sustained project work. The Expressive-Experiential domain corresponds to openness and aesthetic imagination suggesting a more spontaneous, affect-driven form of creative expression. Recognizing both domains helps reconcile cognitive and personality approaches to creativity and illustrates how structured problem solving and imaginative flexibility operate as complementary systems within the creative process. These findings refine Kelly's (2004) original single higher-order interpretation and highlight the theoretical value of examining hierarchical models in creativity research.

Some Convergent Evidence from Subscale Correlations

Correlations among SCAB subscales further supported this interpretation. Strong associations between Creative Engagement and Creative Cognitive Style indicate overlap between behavioral involvement and cognitive processing, whereas modest interrelations among Spontaneity, Tolerance, and Fantasy reflect shared affective and interpersonal qualities. The relative independence between these clusters implies that individuals may differ not only in how much they are creative but in *how* their creativity manifests; that is, through structured problem solving or through expressive, emotionally infused activity. This differentiation also resonates with emerging perspectives that creativity represents a network of interacting but semi-independent subsystems rather than a unitary trait.

Implications for Creativity Assessment

The findings have both theoretical and practical implications. The SCAB appears to capture a broad spectrum of creativity bridging cognitive, affective, and behavioral domains. Recognizing its two-factor structure may enhance interpretation of total and subscale scores in research examining predictors or outcomes of creativity. For instance, the Cognitive-Productive dimension may relate more strongly to openness/intellect, need for cognition, and academic performance, whereas the Expressive-Experiential dimension may align more closely with emotional intelligence, empathy, or aesthetic sensitivity. These distinctions offer a framework for predicting how different personality or situational factors may foster either disciplined, project-based creativity or more fluid, imaginative expression.

From a methodological standpoint, the results underscore the importance of replication and incremental refinement in psychometric research. Despite the SCAB's use in several studies of personality, interests, and creativity (e.g., Kelly & Daughtry, 2008; Kelly & Kelly, 2014; Kelly, 2016; Miller et al., 2012), few independent examinations of its structure have been reported. Replicating and extending the scale strengthens confidence in its validity, promotes theoretical integration across studies, and facilitates meaningful comparison across samples and contexts.

Limitations and Future Directions

Several limitations of the present research should be noted. The sample consisted primarily of young adult students from a single regional university, limiting generalizability. The small number of male and non-White/Caucasian participants precluded analyses of measurement invariance across demographic groups. In addition, the study relied solely on self-report data and correlational methods; causal interpretations cannot be inferred. Future research should replicate these analyses in more diverse populations and incorporate behavioral or performance-based measures of creativity to evaluate external validity. A confirmatory factor analysis (CFA) or structural equation modeling approach could further clarify the SCAB's hierarchical organization and test the stability of the two-factor model in other samples.

Conclusion

Overall, the present findings support the SCAB as a psychometrically reliable and conceptually grounded measure of creativity, reaffirming its five foundational components and revealing a more nuanced higher-order structure. Creativity, as reflected in the SCAB, appears to involve both Cognitive-Productive and Expressive-Experiential dimensions. Each dimension may represent complementary routes through which individuals explore, construct, and express novelty. By confirming and extending the SCAB's factorial validity, this study contributes to a clearer understanding of the multidimensional architecture of creative personality and behavior and provides a useful foundation for future work linking creativity to broader models of cognition, affect, and individual differences.

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